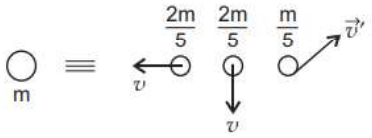
# S ANSWER KEY & SOLUTION KEY FINAL ROUND - 14 (PCB) Dt.23.04.2024

## PHYSICS

### SECTION - A (35 Questions)

01. **(2)** 


By conservation of momentum

$$m(0)=\frac{2m}{5}(-\upsilon\hat{i})+\frac{2m}{5}(-\upsilon\hat{j})+\frac{m}{5}\vec{\upsilon}'$$

$$\Rightarrow \vec{\upsilon}'=2\upsilon\hat{i}+2\upsilon\hat{j}$$

$$\Rightarrow \upsilon'=\sqrt{(2\upsilon)^2+(2\upsilon)^2}=2\sqrt{2}\upsilon$$

02. **(3)** $h=l(1-\cos 60^0)=\frac{l}{2}, v^2=2gh=gl$

Now, $T_{max}=mg+\frac{mv^2}{l}$ (at bottom most point)

$\therefore\ T_{max}=2mg=\mu_s(4mg)$

$\therefore \mu_s=0.5$

03. **(4)**

04. **(3)**

05. **(3)** The Statement I is correct but the Statement II is incorrect.
The air currents at the top have a larger velocity and thus less pressure at the top than at the bottom. The difference in pressure on the two sides of the wing produces the uplift.
Hence, the correct answer is option (3)

06. **(1)**

07. **(1)** Here, $m_1=0.20kg=200g$

$\theta_1=150°C$

$w=0.025kg=25g$

$m_2=V\times d=150\times 1=150g, \theta_2=27°C$

Final temperature, $\theta=40°C, c=?$

As heat lost by metal = heat gained by water and calorimeter

$\therefore m_1c\Delta\theta_1=(m_2+w)\Delta\theta_2$

$200\times c(150-40)=(150+25)(40-27)$

$\therefore c=\frac{175\times 13}{200\times 110}=0.1.$

08. **(1)**

09. **(1)** The electrostatics shielding is possible by metallic conductor.

10. **(1)**

11. **(2)**
Let assume unknown resistance = R
in balancing condition

$$\frac{3}{R}=\frac{60}{40}\Rightarrow R=2\Omega$$

Net resistance after shunting on unknown resistance

$$R_{eq}=\frac{S\times R}{S+R}=\frac{2\times 2}{2+2}=1\Omega$$

Now in balancing condition

$$\frac{3}{1}=\frac{x}{100-x}\Rightarrow x=\frac{300}{4}$$

$= 75$ cm
length changes by $\Rightarrow 75-60=15$ cm

12. **(1)** When the switch $S$ is closed, bulb $B_2$ lights up earlier. This is because growth of current in $B_1$ is opposed by emf induced across $L$. As resistance $R$ is same as that of the coil making up $L$, therefore, finally, both the bulbs acquire equal brightness.

13. **(3)**

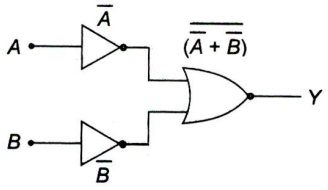
14. **(1)** From conservation of momentum :

$$MV=\frac{h}{\lambda}=hR\left(1-\frac{1}{4}\right)\Rightarrow V=\frac{3}{4}\frac{hR}{M}.$$

15. **(2)** As for first minima

$\sin\theta=\lambda\Rightarrow a\sin 30^0=600\times 10^{-9}$

$\Rightarrow a=1200\times 10^{-9}m\Rightarrow a=1.2\ \mu m$

16. **(3)** 


By dmorgan's theorem $\overline{A+B}=\overline{\overline{A}}\cdot\overline{\overline{B}}\Rightarrow A.B$

17. **(3)** Knowledge based question.

18. **(1)** Distance between the car A and B remains constant.
Let the distance be '$x$'
velocity of C w.r.t. A and B, $v = 45 + 36 = 81$ km/h

$$\text{Distance} = 81 \times \frac{5}{60} = 6.75 \text{ km}.$$

19. **(1)** Amplitude $A_1$ and $A_2$ are added as vectors. Angle between these vectors is the phase difference $((\beta_1 - \beta_2)$ between them.

$$\therefore \ R = \sqrt{A_1^2 + A_2^2 + 2A_1\cos(\beta_1 - \beta_2)}$$

20. **(3)**
21. **(2)**

$$E = \frac{q}{4\pi\varepsilon_0 r^2} \Rightarrow Ar = \frac{q}{4\pi \in_0 r^2} \Rightarrow q = 4\pi\varepsilon_0 Ar^3$$

22. **(1)** Using work energy theorem

$$W = \Delta KE = 0 - \left(\frac{1}{2}mv^2 + \frac{1}{2}I\omega^2\right)$$

$$W = 0 - \frac{1}{2}mv^2\left(1 + \frac{K^2}{R^2}\right)$$

$$= -\frac{1}{2} \times 50 \times (0.4)^2\left(1 + \frac{1}{2}\right) = -6 \text{ J}$$

Absolute work $= +6$ J
$W = -6$ J $\Rightarrow |W| = 6$ J.

23. **(1)** When a metal wire elongates by hanging a load on it, the gravitational potential energy is decreased. Half of lost potential energy stored in form of elastic potential of wire and remaining half in form of heat.

24. **(2)** $R = R_0 A^{1/3}$

$$\therefore \frac{R_1}{R_2} = \left(\frac{A_1}{A_2}\right)^{1/3} = \left(\frac{27}{125}\right)^{1/3} = \frac{3}{5}$$

$$\therefore R_2 = \frac{5}{3} \times 3.6 = 6 \, fermi.$$

25. **(2)** $V_{rms} = \sqrt{\frac{(T/2)V_0^2 + 0}{T}} = \frac{V_0}{\sqrt{2}}.$

26. **(2)** Here, M = 0.005 H, $I = I_0 \sin\omega t$

$$\frac{dI}{dt} = I_0 \cos\omega t(\omega)$$

$$\text{Max. value of } \frac{dI}{dt} = I_0(\omega) \times 1$$

Max. value of emf induced in second coil

$$e_0 = M\left(\frac{dI}{dt}\right)_{max} = 0.005 \times I_0\omega$$

$$e_0 = 0.005 \times 10 \times 100\pi = 5\pi \text{ volt.}$$

27. **(3)** Velocity

$$\upsilon = \omega\sqrt{a^2 - y^2} \ \ or \ \ \upsilon^2 = \omega^2(a^2 - y^2)$$

$$\text{or } \frac{\upsilon^2}{\omega^2} + y^2 = a^2$$

It is an equation of ellipse.

28. **(2)** Given V = 100 ± 5 volts
$l = 10 \pm 0.2$ amperes

$$R = \frac{V}{l}$$

$$\frac{R}{R} = \frac{V}{V} + \frac{l}{l}$$

$$\frac{R}{R} = \frac{5}{100} + \frac{0.2}{10} \Rightarrow \frac{R}{R} = \frac{7}{100}$$

$$\Rightarrow \% \text{ error} = \frac{R}{R} \times 100\% = 7\%$$

29. **(3)** $P_{avg} = V_{rms} I_{rms} \cos(\Delta\phi)$

$$= \frac{200}{\sqrt{2}} \times \frac{50 \times 10^{-3}}{\sqrt{2}} \times \cos\left(\frac{\pi}{3}\right)$$

$$= \frac{10^4}{2} \times \frac{1}{2} \times 10^{-3}$$

$$= \frac{10}{4} = 2.5 \text{ W}$$

30. **(4)** Error in measuring 25 sec. $= \frac{1}{5}\text{sec.} = 0.2$ sec.

$$\therefore \text{ percentage error} = \frac{0.2}{25} \times 100\% = 0.8\%$$

31. **(1)**
32. **(1)**
33. **(2)** Given, $v = 3x^2 - 2x$, differentiating $v$, we get

$$\frac{dv}{dt} = (6x - 2)\frac{dx}{dt} = (6x - 2)v$$

$$\Rightarrow a = (6x - 2)(3x^2 - 2x)$$

Now put, $x = 2$m

$$\Rightarrow a = (6 \times 2 - 2)[3(2)^2 - 2 \times 2] = 80 \text{ m/s}^2$$

34. **(3)** Let force acting on mass $m$ in equilibrium are

$$\vec{F}, \vec{F}_1, \vec{F}_2, \vec{F}_3, \vec{F}_4$$

$$\vec{F} + \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \vec{F}_4 = 0 \text{ [equilibrium condition]}$$

$$\Rightarrow \ \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \vec{F}_4 = -\vec{F} \qquad ...(i)$$

After cutting the string with force $\vec{F}$, the net force on mass $m$

$$\vec{F}_{net} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \vec{F}_4$$

$$\Rightarrow \vec{a} = \frac{\vec{F}_{net}}{m} = -\frac{\vec{F}}{m} \quad \text{[from (i)]}$$

35. **(1)** $U_2 = (2x^2 + 3y^2 + 3z)$

$$\vec{F} = -\left(\frac{\partial U}{\partial x}\hat{i} + \frac{\partial U}{\partial y}\hat{j} + \frac{\partial U}{\partial z}\hat{k}\right)$$

$$= -(4x\hat{i} + 9y^2\hat{j} + 2\hat{k})\text{N}$$

$$\vec{F}_{(1,2,3)} = -(4\hat{i} + 36\hat{j} + 2\hat{k})\text{N}$$

## SECTION - B (Attempt Any 10 Questions)

36. **(3)** The magnetic field due to wire placed along *x*-axis will be zero. The point under consideration is semi finite position of the wires placed along *y*-axis and z-axis.
Magnetic field due to wire placed along *y*-axis,

$$\vec{B}_y = \frac{\mu_i I}{4\pi r}(\hat{k})$$

Magnetic field due to wire placed along z-axis,

$$\vec{B}_z = \frac{\mu I}{4\pi r}(-\hat{j})$$

Hence, net magnetic field, $\vec{B} = \frac{\mu_0 I}{4\pi r}(\hat{k} - \hat{j})$

After substituting the values, we get,

$$\vec{B} = \frac{\mu_0}{8\pi}(\hat{k} - \hat{j})\text{T}$$

37. **(2)** $\mu_r = 500$, I = 1A, $n = 500$ per metre
Magnetisation, $I = \chi H = (\mu_r - 1)nI$
$(500 - 1)\ 500 \times 1$
$I = 2.5 \times 10^5\ \text{Am}^{-1}$

38. **(3)** Speed of wave from wave equation

$$v = -\frac{(\text{coefficient of } t)}{(\text{coefficient of } x)}$$

$$v = -\frac{1000}{(-3)} = \frac{1000}{3}$$

Since speed of wave $\propto \sqrt{T}$

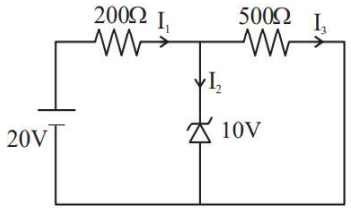
So $\frac{1000}{3} = \sqrt{\frac{273}{T}} \Rightarrow T = 4.41°C$

39. **(2)** If the equation of unknown is
$y' = y + y' = a\sin((\omega t - kx) - a\sin(\omega t + kx)$
$= -a[\sin(\omega t + kx) - \sin(\omega t - kx)]$
$-2a\cos\omega t \sin kx$
At $x = 0$, $y'' = 0$, i.e. a node is formed

40. **(3)** $\delta_{water} = ({}^w\mu_g - 1)A = \left(\frac{{}^a\mu_g}{{}^a\mu_w} - 1\right)A$

$$= \left(\frac{9}{8} - 1\right)A = \frac{A}{8}.$$

41. **(3)**




Zener is in breakdown region.

$$I_3 = \frac{10}{500} = \frac{1}{50}$$

$$I_1 = \frac{10}{200} = \frac{1}{20}$$

$$I_2 = I_1 - I_3$$

$$I_2 = \left(\frac{1}{20} - \frac{1}{50}\right) = \left(\frac{3}{100}\right) = 30\,\text{mA}$$

42. **(4)** Intensity of EM wave is given by

$$I = \frac{P}{4\pi R^2} = u_{av} \cdot c = \frac{1}{2}\varepsilon_0 E_0^2 \times c$$

$$\Rightarrow E_0 = \sqrt{\frac{P}{2\pi R^2 \varepsilon_0 c}}$$

43. **(4)** At these points, the resultant field = 0

44. **(1)** Here $r_1 = 0.05$ m, $r_2 = 0.06$ m

$$C = \frac{4\pi\varepsilon_0 r_1 r_2}{(r_2 - r_1)} = \frac{0.05 \times 0.06}{0.01(9 \times 10^9)} = \frac{1}{3} \times 10^{-10} F$$

Potential difference between the plates, $V$ = 15,000 V
$\therefore$ Charge on the inner sphere,

$$CV = \frac{1}{3} \times 10^{-10} \times 15{,}000 = 5 \times 10^{-7} C.$$

45. **(1)** For the branch containing A, B and C

$$R_{eq} = \frac{3R}{2}$$

Current in A : $I_1 = \frac{E}{R_{eq}} = \frac{2E}{3R}$

Current in each of B and C; $I_1' = \frac{I_1}{2} = \frac{E}{3R}$

for the branch containing D, E, F, G and H;

$$R_{eq} = \frac{7R}{3}$$

Current through D and H : $I_2 = \frac{3E}{7R}$

Current through each of E, F, and G ;

$I_2' = \frac{I_2}{3} = \frac{E}{7R}$ Since $I_1 > I_2 > I_1' > I_2'$

A > D = H > B = C > E = F = G

46. **(2)** At height r from centre of earth, orbital velocity

$v = \sqrt{\frac{GM}{r}}$

By principle of energy conservation

KE of $m + \left(-\frac{GMm}{r}\right) = 0 + 0$

($\because$ At infinity, PE = KE = 0)

or KE of $m = \frac{GMm}{r} = \left(\sqrt{\frac{GM}{r}}\right)^2 m = mv^2$.

47. **(3)** There are $n_0$ moles in each container initially

$n = \frac{P_0V_0}{RT_0}$ ....(i)

$n_1 + n_2 = 2n$

Let final common pressure is $P$

$\frac{PV_0}{2RT_0} + \frac{PV_0}{RT_0} = \frac{2P_0V_0}{RT_0}$

$\frac{P}{2} + P = 2P_0 \Rightarrow P = \frac{4P_0}{3}$

No of moles in container of temperature $2T_0$

$= \frac{PV_0}{2RT_0} = \frac{4P_0}{3} \times \frac{V_0}{2RT_0} = \frac{2}{3}\frac{P_0V_0}{RT_0}$

48. **(1)** Here, Initial angular speed of the wheel,

$\omega_0 = 1800 \times \frac{2\pi}{60}$ rad $s^{-1} = 60\pi$ rad $s^{-1}$

Final angular speed of the wheel,

$\omega = 3000 \times \frac{2\pi}{60}$ rad $s^{-1} = 100\pi$ rad $s^{-1}$

Time during which this change of speed takes place,

$t = 20$ s

Let $\alpha$ be angular acceleration of the wheel.

$\therefore \alpha = \frac{\omega - \omega_0}{t} = \frac{100\pi - 60\pi}{20}$ rad $s^{-2} = 2\pi$ rad $s^{-2}$

49. **(3)** Given that initially the system is at rest,

i.e., $\vec{V}_{CM} = 0$

So $\vec{V}_{CM}$ = constant = 0

i.e., $\frac{m\vec{v} + M\vec{V}}{m+M} = 0$

or $m\vec{v} + M\vec{V} = 0$ [as (m + M) = finite]

i.e., $M\vec{V} = -m\vec{v}$ .....(i)

Furthermore, here it is given that ;

$\vec{v}_{rel} = \vec{v} - \vec{V}$ .....(ii)

Putting the value of $\vec{v}$ from eq. (ii) in eq.(i), we get ;

$M\vec{V} = -m(\vec{v}_{rel} + \vec{V})$

or $\vec{V} = -\frac{m\vec{v}_{rel}}{m+M}$

Thus, it is clear that the direction of motion of balloon is opposite to that of climbing $(\vec{v}_{rel})$, i.e., vertically down.

50. **(4)** $(n)$ = Number of particle passing from unit area in unit time =

$\frac{\text{No. of particle}}{A \times t} = \frac{[M^0L^0T^0]}{[L^2][T]} = [L^{-2}T^{-1}]$

$[n_1] = [n_2]$ = No. of particle in unit volume = $[L^{-3}]$

Now, from the given formula $[D] = \frac{[n][x_2 - x_1]}{[n_2 - n_1]}$

$= \frac{[L^{-2}T^{-1}][L]}{[L^{-3}]} = [L^2T^{-1}]$.

# CHEMISTRY

## SECTION - A (35 Questions)

51. **(2)** A–(i), B–(iv), C–(ii), D–(iii)

52. **(2)** Conceptual fact.

53. **(3)** Statement-1 is false, Statement-2 is true

54. **(3)** The equilibrium is affected when the pressure is constant and the value of $\Delta n_g \neq 0$.

55. **(3)** Using formula $\Delta E = hcR_H\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$

For lowest energy of spectral lines in Lyman series, $n_1 = 1, n_2 = 2$

So, $\Delta E = hcR_H\left[\frac{1}{(1)^2} - \frac{1}{(2)^2}\right] = hcR_H \times \frac{3}{4}$

$\Delta E = \frac{3}{4}hcR_H$

56. **(2)** Adenine and thymine: guanine and cytosine

57. **(3)** $C_2H_5Br + NaOC_2H_5 \xrightarrow{\Delta} C_2H_5\text{-}O\text{-}C_2H_5 + NaBr$

58. **(1)** A-III, B-I, C-II, D-IV

59. **(3)** $P_4 + 3NaOH + 3H_2O \rightarrow \underset{\text{Phosphine}}{PH_3} + 3\underset{\substack{\text{Sodium}\\\text{hypophosphite}}}{NaH_2PO_2}$

60. **(2)** The dissociation of the given compounds are as follows

$CaCl_2 \rightarrow Ca^{2+} + 2Cl^-; i = 3$

$K_4[Fe(CN)_6] \rightarrow 4K^+ + [Fe(CN)_6]^{4-}; i = 5$

$AlCl_3 \rightarrow Al^{3+} + 3Cl^-; i = 4$

$NH_2CONH_2 \rightarrow$ does not dissociate, i = 1

Since, $K_4[Fe(CN)_6]$ given 5 ions in the solution. Hence, has maximum van't Hoff factor.

61. **(2)** (A) The molar mass of hydrogen peroxide is 34 g/mol, The molarity of 34 g of hydrogen peroxide in 500 mL is $\frac{34}{34} \times \frac{1000}{500} = 2\,M$.

(B) The normality of hydrogen peroxide is twice its molarity. It is $2 \times 2 = 4$ N.

(C) Percent w/V of hydrogen peroxide solution is

$$\frac{34g \times 1000\,mL/L}{500\,mL} = 68\%.$$

(D) Volume strength = 11.2 × molarity
= 11.2 × 2 = 22.4 g/L

Hence, the correct match is
A-(iv), B-(iii), C-(i), D-(ii)

62. **(1)** $(CH_3)_2CHOH + PBr_3 \longrightarrow$
(iso-Propyl alcohol)

$(CH_3)_2CHBr \xrightarrow[(aq)]{KOH} CH_3-\underset{\underset{CH_3}{|}}{CH}-OH$
(A) (Propan-2-ol) (B)

63. **(1)** 1-(4); 2-(3); 3-(2); 4-(1)

64. **(4)** Zn (II)

65. **(4)** (a)-(iii), (b)-(i), (c)-(ii)

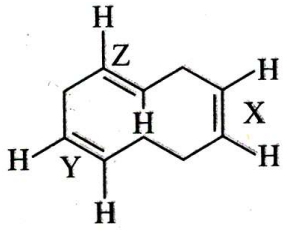
66. **(4)** According to Bohr model, radius of hydrogen atom

$$r_n = \frac{0.529 \times n^2}{Z}\text{Å}$$

where, n = number of orbit
Z = atomic number (Z = 1 for hydrogen)

$$r_3 = \frac{0.529 \times (3)^2}{1} = 0.529 \times 9 = 4.761\text{Å}$$

67. **(1)**




68. **(2)** Diastereomers

69. **(4)** Work done is given as, $W = -p_{ext} \times \Delta V$
Since, gas enters the vacuum bulb, $p_{ext} = 0$.
∴ Work done is zero.

70. **(3)** We know that, $K_p = K_C(RT)^{\Delta n_g}$

$\Delta n_g = 2 - 4 = -2$

$K_p = 0.50(RT)^{-2} = 0.50\ (0.082 \times 673)^{-2}$
$= 1.64 \times 10^{-4}$

71. **(4)** According to first law of thermodynamics,

$\Delta U = q + W$

For isothermal process, $\Delta U = 0$
Hence, $q = -W$
For cyclic process, $\Delta U = 0$
Hence, $q = -W$
For isochoric process, $\Delta V = 0$
Hence, $\Delta U = q$
$(W = p\Delta V = 0)$
For adiabatic process, $q = 0$
Hence, $\Delta U = W$

Thus, only option (4) is incorrect

72. **(3)** Half-cell reactions are
(i) At cathode,

$Fe^{2+} + 2e^- \rightarrow Fe; E^o_{Fe^{2+}/Fe} = -0.44\ V$

(ii) At anode,

$Sn \rightarrow Sn^{2+} + 2e^-; E^o_{Sn/Sn^{2+}} = -0.14\ V$

$E^o_{cell} = E^o_{Fe^{2+}/Fe} - E^o_{Sn/Sn^{2+}}$
$= -0.44 + 0.14 = -0.30\ V$

73. **(1)** Boiling point $\propto$ Molar mass

74. **(2)** $CH_3MgI + H_2O$ gives 1 mole of $CH_4$
16.6 gram of $CH_3MgI$ is 0.1 mole gives 0.1 mole of $CH_4$ gas = 2.24 L.

75. **(2)** Electronic configuration of Osmium is $5d^6 6s^2$. Since 5d and 6s sub-shells have nearly equal energy. All the 8 electrons participate in bonding.

76. **(1)** Poor shielding of one of 4f electrons by another in the subshell

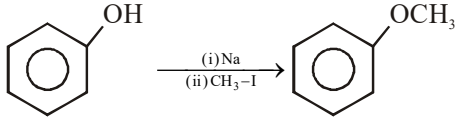
77. **(4)** For first order reaction,

rate = $k[N_2O_5]$
$2.40 \times 10^{-5} = 3.0 \times 10^{-5}\ [N_2O_5]$
∴ $[N_2O_5] = 0.8$

78. **(4)**
Statement I is true but Statement II is false.
The correct statement for II is
$E_{cell} = E_{cathode} - E_{anode}$
If $E_{cell}$ should have a positive value for the cell to function then, $E_{cathode} > E_{anode}$ should be followed.

79. **(4)** Benzoic acid

80. **(2)**



81. **(4)** Stability of +3 oxidatin states increases on accout of inert pair effect. Reducing character of hydrides increases down the group because bond dissociation energy decreases down the group.

82. **(1)** $[Co(en)(NH_3)_2Cl_2]Cl$ exists in three geometrical isomeric forms and on of the geometrical isomers exhibit enantiomers.

83. **(1)** The given reaction is an example of disproportionation reaction. In this reaction, chlorine is oxidised as well as reduced.
The oxidation states of chlorine in $ClO^-$ (aq), $ClO_3^-$ (aq) and $Cl^-$ are +1, +5 and –1 respectively.
Hence, (A) is false but (R) is true.

84. **(1)** Let A denotes benzene and B denotes toluene
In 1 : 1 molar mixture of A and B,
Mole fraction of A and B are

$$x_A = \frac{1}{2}, x_B = \frac{1}{2}$$

Vapour pressure of

$$A = p_A^\circ x_A = 12.8 \times \frac{1}{2} = 6.4\,kPa$$

Vapour pressure of

$$B = p_B^\circ x_B = 3.85 \times \frac{1}{2} = 1.925\,kPa$$

Thus, vapour will contain high percentage of benzene than toluene.

85. **(1)** Sodium phenoxide

## SECTION - B (Attempt Any 10 Questions)

86. **(1)** de-Broglie wavelength of electron,

$$\lambda = \frac{h}{mv} = \frac{h}{\sqrt{2eVm}} \quad \left(\because eV = \frac{1}{2}mv^2\right)$$

$$= \frac{6.626 \times 10^{-34}}{\sqrt{2 \times 1.6 \times 10^{-19} \times V \times 9.1 \times 10^{-31}}}$$

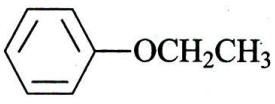
$$= \frac{6.626 \times 10^{-34}}{5.396 \times 10^{-25}[V]^{1/2}}$$

$$= \frac{1.227 \times 10^{-9}}{[V]^{1/2}}\,m$$

$$= \frac{12.27 \times 10^{-10}}{[V]^{1/2}}\,m$$

$$\frac{12.27}{[V]^{1/2}}\,Å \approx \left[\frac{150}{V}\right]^{1/2} Å$$

87. **(3)** (i), (ii) and (iv) only

88. **(4)** 

89. **(2)** (H–F.....H–F.....H–F), $NH_3$ and $H_2O$ will form a three-dimenstional polymeric structure and H-bonds in HCl are not very strong as in HF. So, formation of polymeric structure is difficult.

90. **(3)** Follow IUPAC rule.

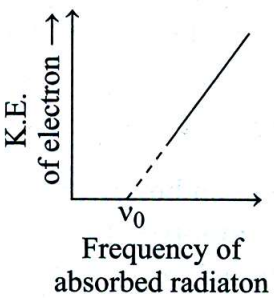
91. **(2)** For production of 180 g of glucose; heat energy is required = x kcal $mol^{-1}$
Number of moles of glucose to be produced

$$= \frac{1.6}{180}$$

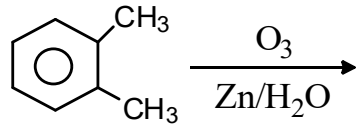
$$-0.64 = \frac{x}{180} \times 1.6$$

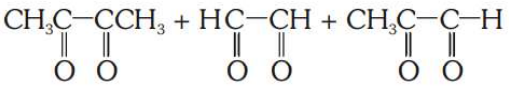
$$x = \frac{-0.64 \times 180}{1.60} \Rightarrow -72\ kcal\ mol^{-1}$$

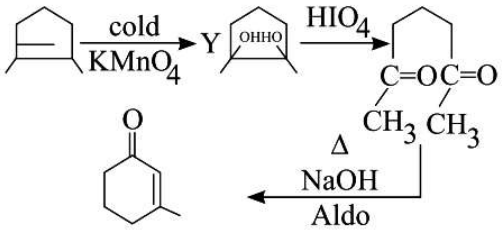
92. **(2)** The correct graph regarding photoelectric effect is




$h\nu = K.E. + \phi$

93. **(4)** 



94. **(2)** 


95. **(1)** $[Cr(NH_3)_4BrCl]Cl \xrightarrow{AgNO_3}$
(X)

$[Cr(NH_3)_4ClBr]^+ + NO_3^- + AgCl$ (white ppt)

$[Cr(NH_3)_4Cl_2]Br \xrightarrow{AgNO_3} [Cr(NH_3)_4Cl_2]^+$
(Y)

$+ NO_3^- + AgBr$ (yellow ppt)

96. **(3)** Among the given statements, only A and D are incorrect while the statements B, C and E are correct.

The correct form of incorect statements are :
Bonding molecular orbital has lower energy than antibonding moelcular orbital
In a stable moelcule, the number of electron bonding in molecular orbital is always greater than the number of antibonding electrons.

97. **(3)** We know that,

$$\Delta G = -2.303\ RT \log K$$
$$= -2.303 \times 8.314 \times 298 \log 50$$
$$= -9694\ J = -9.694\ kJ$$

98. **(1)** For a salt of weak acid and weak base;

$$pH = 7 + \frac{1}{2}(pK_a - pK_b)$$

$$= 7 + \frac{1}{2}(5.23 - 4.75) = 7.24$$

99. **(4)** If both the Assertion and Reason are incorrect

100. **(2)** $RCN \xrightarrow{\text{Hydrolysis}} RCOOH + NH_3$

$RCH = NOH \xrightarrow{\text{Reduction}} RCH_2NH_2 + H_2O$

$RNC + 2H_2O \xrightarrow{\Delta} RNH_2 + HCOOH$

$RCONH_2 \xrightarrow{\text{Hydrolysis}} RCOOH + NH_3$

# BOTANY

## Section - A (35 Questions)

101. **(4)** ( NCERT 11th Page no.39 last line of 1st para.)
102. **(3)** (NCERT 12th Page no.248 fig 14.4 (a))
103. **(2)** (NCERT 11th Page No. 74; Sub-topic 5.5.1.2)
104. **(3)** (NCERT 12th Pg 83, 5.3.3 Linkage and Recombination based)
105. **(1)** (NCERT 12th Pg 89, Figure 5.14)
106. **(2)** (NCERT 11th Page no.29 3rd para )
107. **(4)** [NCERT 11th, Page 249, point 15.4.3.3]
108. **(2)** [NCERT 11th, Page 250, point 15.4.3.4 (Line no. 01)]
109. **(3)** (NCERT 12th, Pg. 83, Linkage based)
110. **(3)** (NCERT 11th Page No. 76; Sub-topic 5.6)
111. **(1)** (NCERT 11th Page No. 77; Figure 5.18)
112. **(2)** (NCERT 12th, Pg 99, 6.1.2 Packaging of DNA Helix, Para 3, Line 4)
113. **(3)** (NCERT 12th, Pg. 103, para 4-5, Pg 108, Line 4, Pg. 106, para 2, Pg 115, para 4, Line 8)
114. **(3)** (NCERT 11th para10.2.1 based / Page no.165)
115. **(3)** (NCERT 11th page no. 213, 2nd paragraph 5th and 6th line)
116. **(2)** (NCERT 11th page no. 216, 13.7.2, 1 and page no. 219, 2nd paragraph)
117. **(1)** (NCERT 11th, Page no- 26, last paragraph, Line no- 1,2)
118. **(2)** (NCERT 12th, Page no- 25, Paragraph- 2, Line no- 4,5)
119. **(1)** (NCERT 11th para 10.1.1,10.2.1, based / Page no.163,164,165)
120. **(4)** (NCERT 12th, Pg 91, 5.8.3 Chromosomal Disorders, Para 2)
121. **(3)** [ NCERT 11th, Page no. 89, Line no.- 12-14]
122. **(3)** (NCERT 11th Page no.30,3.1 3rd para.)
123. **(2)** (NCERT 11th Pg.233, 14.4)
124. **(4)** (NCERT 12th, Pg 76, 5.2.2.1 Incomplete Dominance concept)
125. **(3)** (NCERT 12th, Pg117, Figure 6.14 The lac Operon)
126. **(3)** (NCERT 12th, Pg. 108, Para 2, Line 10)
127. **(3)** (NCERT 12th, Pg. 75, 5.2.2 Law of Segregation, Line 5)
128. **(3)** (NCERT 11th Pg.230, 3rd Para, 13th line)
129. **(4)** (NCERT 12th, Pg 114, Para 1, Line 1 based)
130. **(1)** (NCERT 11th, Page no- 19, Paragraph- 2.1.2, Line no-6-8)
131. **(1)** (NCERT 11th Page no- 21, Paragraph- 2.2.4, Line no-1-3)
132. **(1)** (NCERT 11th para 8.5.1 based conceptual / Page no.131)
133. **(2)** (NCERT 11th para 8.5.3.1 based / Page no.133)
134. **(2)** (NCERT 11th, Page no-7, 1st paragraph, Line no- 4)
135. **(2)** (NCERT 12th, Page no- 26, Figure- 2.8 (a))

## SECTION - B (Attempt Any 10 Questions)

136. **(4)** [NCERT 11th, Page no. 92 (Figure 6.7), 93 (Line no.- 01-08)]
137. **(2)** (NCERT 11th conceptual – page no. 214, point (b) and (c))
138. **(1)** [NCERT 11th, Page 249 and 250, point 15.4.3.3]
139. **(3)** (NCERT 11th para 10.4.1 based / Page no.169)
140. **(3)** (NCERT 12th, Page no- 36, 1st paragraph, Line no- 1-4)

141. **(4)** (NCERT 11th, Living world, whole chapter conceptual)
142. **(4)** (NCERT 11th para 8.5.1 conceptual based / Page no.131)
143. **(2)** (NCERT 11th, Page no- 17, 3rd paragraph, Line no- 1-10)
144. **(2)** (NCERT 11th Pg.232, Fig. 14.3)
145. **(3)** (NCERT 12th, Page No 112, Para 2)
146. **(4)** (NCERT 11th Page No. 80; Sub-topic 5.9.2 and added famiy)
147. **(1)** (NCERT 11th, Page no- 21, Paragraph- 2.2.4, Line no-1-3)
148. **(1)** (NCERT 11th para 8.5.1 conceptual based / Page no.131)
149. **(4)** (NCERT 11th Page no.34 to 39 concept based.)
150. **(3)** (NCERT 12th Page no.243,14.3,2nd para,4th line.)

# ZOOLOGY

## Section - A (35 Questions)

151. **(3)** (NCERT 12th Page No. 148-149)
152. **(1)** (NCERT 11th; Page No. 52; Phylum Aschelminthes)
153. **(4)** [NCERT 11th P.No.318, Last 5 lines]
154. **(4)** (NCERT 11th p.no 118, para3, line 8)
155. **(2)** (NCERT 11th Page No - 185 - Mechanism of breathing)
156. **(4)** (NCERT 12th, p.no 51, line17)
157. **(2)** (NCERT 12th, p.no 53, Figure 3.12)
158. **(4)** [NCERT 11th Page No.304, Last Para]
159. **(2)** ( NCERT 12th Page no.228,13.2.2,1st para.)
160. **(2)** (NCERT 12th p.no 61, para1, line 2)
161. **(2)** (NCERT 11th p.no 114, para3, line 3)
162. **(2)** (NCERT 11th , Page no- 144, Paragraph- 1, Line no- 1-3, and Page no-145, Figure- 9.1)
163. **(2)** (NCERT 11th,Page no- 155, Paragraph- 2, Line no- 1-6)
164. **(3)** (NCERT 12th para 10.2.3 / Page no.183 )
165. **(3)**(NCERT 12th 10.1 BIOTECHNOLOGICAL APPLICATIONS IN AGRICULTURE )
166. **(3)** (NCERT 12th , Page no-138, Figure-7.9)
167. **(2)** (NCERT 12th, Page no- 138, 1st paragraph, Line no- 5)
168. **(4)** [NCERT 12th P.No.213, Ethical Issues , 3rd para, 2nd Line]
169. **(4)**[NCERT 12th P.No.213, Biological Products , 6th ine]
170. **(3)** [NCERT 12th P.No.202, PCR applied ]
171. **(4)** (NCERT 12th, Page no- 129, Paragraph- 7.3, Line no- 12, 13)
172. **(2)** (NCERT 11th ; Page No.57; Class- Osteichthyes)
173. **(4)** (NCERT 11th ; Page No. 334, last line of 1st paragraph)
174. **(2)** (NCERT 12th Page no.259,15.1.1,5th line)
175. **(2)** (NCERT 12th p.no 51, para 1, line1)
176. **(2)** (NCERT 11th ; Page No.297; 4th line of 4th paragraph)
177. **(4)** [NCERT11th P.No.312, Disorders]
178. **(4)** (NCERT 11th Pg. No. 199-200)
179. **(3)** (NCERT 12th Page no.234, (ii), 1st para.)
180. **(3)** (NCERT 12th p.no 59, para2, line 8)
181. **(4)** [NCERT 11th P.No.312, Synovial Joints]
182. **(3)** [NCERT 11th P.No.321, Line 9 to 12]
183. **(4)** (NCERT 11th Page No - 196 - Coagulation of blood)
184. **(3)** (NCERT 12th Page No - 148 - Malaria)
185. **(4)** (NCERT 11th Page No. 271)

## SECTION - B (Attempt Any 10 Questions)

186. **(1)**(NCERT 12th , Page no- 131, 2nd paragraph, Line no- 1-7)
187. **(1)** (NCERT 11th, Page no- 147, Table- 9.4)
188. **(3)** (NCERT 12th para 10.5 / Page no.186,187 )
189. **(4)** (NCERT 12th Page no.266,2nd para to 267,3rd para)
190. **(4)** (NCERT 11th , p.no 101, para3, line 6)
191. **(3)** (NCERT 12th, p.no 60, para1, line 10)
192. **(3)** (NCERT 12th Page No - 145 - Introduction)
193. **(3)** (NCERT 12th Page No - 150 - Immunity)
194. **(4)** (NCERT 11th Page No - 202 - Double Circulation)
195. **(1)** (NCERT 11th mixed question of A.K. and organisms and population.)
196. **(3)** (NCERT 11th, Conceptual (chemical co-ordination)
197. **(2)** (NCERT 11th ; Page No. 296 13th line of 1st paragraph)
198. **(3)** [NCERT 11th P.No.311,Pelvic Girdle,Page 310 3rd & 4th line,Page 312 Disorders ]
199. **(2)** [NCERT 11th P.No.317, Line 18-19 Applied ]
200. **(2)** [NCERT 12th P.No.211, Last Para]